

31st and were justified by the following maximum velocities: Hatteras, SW., 42 miles; Kittyhawk, S., 36 miles; Cape Henry, E., 36 miles; Delaware Breakwater, E., 40 miles; Sandy Hook, E., 54 miles; New York, NE., 41 miles; Eastport, NE., 38 miles; and by velocities of more than 25 miles at a large number of other stations on the coast. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean: S. SW. *Wyoming*, 30th, in 44° 44' N., 54° W., SE. to NW., moderate breeze to hard gale, with frequent snow squalls; 31st, in 43° 12' N., 57° 33' W., NW., fresh to strong gale and squally, high sea; Feb. 1st, in 42° N., 63° 35' W., SE. to NW., strong gales, cloudy with heavy rain; 2d, in 40° 38' N., 69° 37' W., N. to W., heavy gale, with moderate breeze, fine weather.

### INTERNATIONAL METEOROLOGY.

International charts Nos. IV and V accompany the present REVIEW for January, 1882. The former is published for November, 1879, and continues the series of this chart commenced in January, 1877. The "Beobachtungen auf dem Nordatlantischen Ocean" kindly furnished this office through the courtesy of Prof. Dr. G. Neumayer, Director of the German Marine Observatory, has not been used in the preparation of chart No. IV, owing to unavoidable delay in the receipt of the data. Chart No. V is prepared for the month of February, 1880, and continues the series of this chart commenced in November, 1877.

Chart No. IV shows the mean pressure, temperature and prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of November, 1879, over the Northern, and at certain isolated stations in the Southern Hemisphere. There are no marked centres of barometric minima for the present month, owing to a more uniform distribution of mean atmospheric pressure, particularly over the land areas. Three areas of comparatively low pressure are distributed as follows: one between the Azores and Madeira Islands, barometer 29.90; another over the Okhotsk Sea, barometer 29.90, and the last central over Greenland, the isobar of 29.80 passing thence northeastward north of parallel 70° N. to northern Scandinavia and Lapland. The continued progress of areas of high pressure from the region of the Azores northeastward over northern Europe effected a very marked change in the distribution of mean atmospheric pressure off the western coast of that country. The unvarying conditions of the past six months or more have finally been reversed by the formation of an area of barometric maxima over the British Isles and one of barometric minima over the Azores. There are four principal areas of high pressure for the month distributed as follows: in central Mexico, 30.30; off the western coast of Ireland, 30.30; in southeastern Siberia, 30.30; in the southeastern portion of the United States, 30.20. The extreme mean pressures for the month are, 29.71 (lowest) at Gothaab and 30.34 (highest) at Mexico. The extreme monthly range of mean pressure is 0.63 inch, which is 0.63 inch smaller than the range for November, 1877, and 0.68 inch smaller than for the same month in 1878. The following extreme monthly mean temperatures are given in Fahrenheit's scale: *Lowest*, York Factory, 3°; Nertchinsk, 8°; Yeniseisk, 9°; Nikolaievsk, on the Amoor, 13°; Archangel and Barnaul, 14°; Fort Garry and Haparanda, 15°; Moose Factory, 18°; Ekaterinburg, 19°; *Highest*, Free Town, 86°; Paramaribo, 83°; Manila, 81°; Bridgetown, 80°; Poona, 79°; Bombay, Fort de France, Mauritius, and St. Thomas, 78°; Nassau and Santiago de Cuba, 76°; Havana, 75°. The prevailing direction of the winds over the United States, was *northeast to northwest* in the Atlantic coast States; *southerly* in the Gulf States, Ohio Valley and Tennessee; *southwest to northwest* in the Lake Region; *northwesterly* in the Upper Mississippi and Missouri Valleys and Northwest; *variable* in the Plateau and Pacific Coast Regions. Over Canada and in the Maritime Provinces, *north to west*. In central Mexico, *calms*. Over the Atlantic Ocean,

*northeasterly* from the European coast westward to near 40° W. and from the American coast eastward to same parallel, *north-east to northwest and southwest*. In Europe, *northeast to northwest*, except *southerly* along the Norway coast and in central Russia. In Algiers, *northeast to northwest*. In Hindostan, *northerly*. Along the Asiatic coast and over the Japan Islands, *northeasterly*. Compared with November, 1877 and 1878, the temperature over the United States is generally lower except in the Gulf and South Atlantic States where the isotherm of 60° nearly replaces that of 50° in the two previous years. In barometer there is a marked rise in the Gulf and South Atlantic States, an area of 30.20 replacing that of 30.10; elsewhere there is but little change. Over the Atlantic the change in pressure is a very marked one, particularly in that region included between the parallels of 45° and 65° N. and the meridians of 10° and 35° W. where, as compared with November, 1877, the isobar of 30.30 replaces that of 29.40, and as compared with November, 1878, it replaces that of 29.90. In the region of the Azores there is a decided fall, amounting to over 0.2 inch, while off the American coast in the vicinity of 35° N., 70° W. a very noticeable rise occurs. With respect to temperature there is a general rise north of parallel 40°, increasing slightly with the latitude; elsewhere the changes are unimportant. In the various countries of Europe and Asia, the following changes appear: British Isles, temperature slightly lower and the pressure from 0.45 to 0.73 inch higher. Scandinavia and Denmark, temperature from 5° to 12° lower and the pressure from 0.20 to 0.35 inch higher. France, temperature from 1° to 7° lower and the pressure from 0.28 to 0.33 inch higher. Germany, temperature from 5° to 7° lower and the pressure from 0.20 to 0.25 inch higher. Austria, temperature from 7° to 14° lower and the pressure from 0.05 to 0.07 inch higher. Spain and Portugal, temperature from 4° to 6° higher with an increase in pressure of from 0.01 to 0.04 inch. Italy, temperature from 1° to 3° lower and the pressure from 0.01 to 0.07 inch higher. Algeria, temperature from 1° to 7° higher with an increase in pressure of 0.05 to 0.12 inch. Turkey, temperature slightly higher and the pressure from 0.01 to 0.05 inch lower. British India, temperature from 1° to 4° lower while the pressure shows little or no change. Russia and Siberia, temperature from 1° to 5° lower and the pressure from 0.01 to 0.04 inch higher. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of November, 1879, as compared with the means of the past two years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Temperature.			Mean Barometer.		
	Nov., 1877-78.	Nov., 1878.	Departure.	Nov., 1877-78.	Nov., 1879.	Departure.
York Factory.....	15.9	2.9	+12.1	29.85	30.11	+0.16
Godthaab.....	28.0	26.8	-1.2	29.73	29.71	-0.02
Stykkisholm.....	31.0	37.0	+6.0	29.68	29.96	+0.28
Tromsø.....	32.2	28.9	-3.3	29.51	29.76	+0.25
Thorshavn.....	39.4	41.5	+2.1	29.55	30.13	+0.58
Archangel.....	31.3	14.0	-17.3	29.76	29.84	+0.08
Ekaterinburg.....	29.1	19.0	-10.1	30.18	30.02	-0.16
Barnaul.....	21.0	14.4	-6.6	30.36	30.22	-0.14
Yeniseisk.....	11.3	9.3	-2.0	30.31	30.19	-0.12
Nikolaievsk on the Amoor.....	8.9	13.3	+4.4			
Zi-Ka-Wei.....	58.6	52.3	-6.3	30.32	30.23	-0.09
Tokel.....	47.6	46.8	-0.8	30.12	30.10	-0.02
Pekin.....	35.3	38.7	+3.4	30.32	30.27	-0.05
Tashkend.....	40.6	41.4	+0.8	30.46	30.24	-0.22
Nukuss.....	41.7	42.8	+1.1	30.29	30.18	-0.10
Beirut.....	73.4	70.3	-3.1	30.04	30.04	Normal
Mauritius.....	78.2	77.9	+0.3	30.02	30.05	+0.03
Fort Napier.....	77.2	77.1	-0.1	29.81	29.78	-0.03
Cape Town.....	72.9	72.6	-0.3	30.02	30.01	-0.01
Free Town.....	85.9	86.4	+0.5	29.93	29.94	+0.01
Paramaribo.....	83.1	82.8	-0.3	29.87	29.95	+0.08
Funchal.....	70.1	69.6	-0.5	30.09	29.88	-0.21
Punta Delgado.....	68.3	66.1	-2.2	30.14	29.91	-0.23
Angra.....	62.3	62.6	+0.3	30.14	29.91	-0.23
Bridgetown.....	81.6	80.2	-1.4	29.91	29.91	Normal
Nassau.....	81.5	79.7	-1.8	29.92	29.91	-0.01
Medellin.....	66.3	65.4	-0.9			
San Jose de Costa Rica.....	64.5	66.6	+2.3			

Comparative Thermometric and Barometric Means, etc.—Continued.

STATION.	Mean temperature.			Mean barometer.		
	Nov. 1877-78	Nov., 1878	Departure.	Nov. 1877-78	Nov., 1878	Departure.
Mexico.....	49.2	46.8	- 2.6	30.25	30.29	+ 0.04
Melbourne.....	55.8	57.0	+ 1.2	29.96	29.82	- 0.14
Hobart Town.....	54.3	55.4	+ 1.1	29.67	29.68	+ 0.01
San Juan de Puerto Rico.....	78.7	78.1	- 0.6	29.50	29.98	+ 0.48
Nassau.....	74.9	75.7	+ 0.8	30.02	30.09	+ 0.07
Havana.....	74.9	74.9	Norm'l	29.98	30.06	+ 0.08
Astrakhan.....	44.8	40.5	- 4.3	30.25	30.19	- 0.06
Athens.....	63.6	60.1	- 3.5	30.04	30.02	- 0.02
Lahore.....	69.0	65.5	- 3.5	29.97	30.00	+ 0.03
Tiflis.....	55.5	54.0	- 1.5	30.20	30.15	- 0.05
Laghout.....	61.1	68.4	+ 5.3	30.07	29.15	- 0.92
Fort de France.....	79.8	77.7	- 2.1	29.83	29.93	+ 0.10
Lisbon.....	58.3	61.7	+ 3.4	30.07	29.98	- 0.09
Madrid.....	51.6	56.1	+ 4.5	30.02	30.04	+ 0.02
Cagliari.....	63.1	62.1	- 1.0	29.95	29.96	+ 0.01
Gibraltar.....				30.14	29.96	- 0.18
Swadwick Manse.....	42.0	43.5	+ 1.5	29.55	30.22	+ 0.67
Malta.....	68.3	64.9	- 3.4	29.97	29.98	+ 0.01

**Chart No. V.**—This chart displays the tracings of the probable courses of twenty of the principal storm areas of the Northern Hemisphere for the month of February, 1880. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data, which reaches this office in various ways, from the logs of vessels of the *Merchant Marine* of the North Atlantic and North Pacific oceans. Concerning the general distribution of the paths of the areas of barometric minima, the following is given: one area crossed southern Greenland from the northern portion of the British Possessions. Fifteen areas traversed portions of the United States, five of which came from the Pacific ocean, five from the British Possessions and one from the Gulf of Mexico. Twelve of these areas reached the Atlantic ocean, five of which crossed the same to the mainland of northern Europe. Over the ocean, one area first appeared south of Greenland, two off the northwestern coast of Norway and one north of the Azores. Of the storms in North America, the following detailed descriptions are given: No. I.—This depression is charted as a continuation of area No. XXI, of the January, 1880, chart. Central morning of the 1st in the lower St. Lawrence Valley, it moved rapidly eastward during the day, and by the following morning was central off the banks of Newfoundland. 2d, in 44° 20' N., 43° 57' W., 29.35, W., force 5, vessel had just passed storm centre; in 46° 13' N., 39° W., WSW., strong gale, high sea; in 46° 25' N., 41° W., NW. strong gale, high sea. Throughout the Canadian Maritime Provinces the winds were northwesterly, with increased force, and an area of 30.40 rapidly approached from the Province of Quebec. During the day the course of the depression curved to the NNE., and by the morning of the 3d it had combined with area No. III, then central between Greenland and Iceland. No. II.—This depression appeared in the Western Gulf on the 1st. In central and southern Texas rain and snow, with northeast to northwest winds, prevailed during the day. To the northward a high pressure area of 30.40 and above extended over the Mississippi and and Missouri Valleys to Manitoba. On the 2d the depression was central off the coast of Louisiana, and rain was quite general throughout the Gulf States; New Orleans, 29.62, a fall of 0.53 inch in past 24 hours, wind shifted from NE. 10 miles per hour to E. 29 miles, weather changed from cloudy to heavy rain; Galveston, 29.87, a fall of 0.29 inch, W., 22 miles per hour, threatening. During the day the depression passed rapidly northeastward over the northern portion of the Eastern Gulf States, and on the morning of the 3d was central in southeastern Virginia; Washington, D. C., 29.33, a fall of 1.16 inches, N., light rain; Norfolk, 29.35, a fall of 1.01 inches, SW., 28 miles per hour, fair; Lynchburg, 29.43, a fall of 1.02 inches, NW., light snow; Baltimore, 29.32, a fall of 1.19

inches, E., light rain; Cape May, 29.24, a fall of 1.24 inches, E. 24 miles per hour, foggy; Cape Hatteras, 29.42, a fall of 0.89 inch, W., 34 miles, light rain, 3.54 inches rainfall in past 24 hours; Portsmouth, N. C., 2.98 inches rainfall in past 24 hours; Cape Lookout, N. C., 2.91 inches rainfall in past 24 hours. Off the Middle Atlantic coast heavy northeast to southeast gales prevailed. In 37° N., 71° 30' W., heavy gale from ESE. to WSW. veering to W., lasting 26 hours, heavy sea and snow squalls, vessel before wind under bare poles for 10 hours, lost deck load; in 38° 40' N., 73° W., heavy gale from NE. to NW., increasing at 2 p.m. to violent hurricane; off Fire Island, terrific gale from E. veering to NW. and increasing to hurricane with high sea; off Cape Fear, heavy gale from E. veering to S. and W.; in 42° N., 62° 24' W., NW., heavy gale; in 41° N., 67° W., NE. to SE., strong gale and snow; in 38° N., 69° 30' W., heavy westerly squalls and high sea. 4th, depression central over the Gulf of St. Lawrence. Sydney, N. S., 29.15, a fall of 1.28 inches, SW., 24 miles per hour, cloudy; Charlottetown, P. E. Island, 29.06, a fall of 1.35 inches, NE., light snow; Little Glace Bay, N. S., 29.12, a fall of 1.29 inches, SE., cloudy; Windsor, N. S., 29.27, a fall of 1.14 inches, SW., snow. Snow with southwest to northwest winds was quite general throughout the Canadian and Maritime Provinces. Over the ocean between the parallels of 40° and 50° N., and west of 40° W., heavy westerly gales were experienced. In 41° N., 66° 40' W., SE. to WNW., heavy gales, high confused sea; in 43° N., 52° W., heavy southwesterly gale; in 41° N., 58° W., violent westerly gale, vessel dismasted; in 42° 15' N., 46° 55' W., succession of violent gales from SW to WNW., with high confused sea; 5th, depression central in about 40° N., 50° W.; in 50° 38' N., 42° 15' W., 29.13, W., force 7, heavy westerly squalls, high confused sea; in 51° 30' N., 42° 20' W., 29.10, SW., force 8, heavy rain squalls; in 46° 20' N., 46° 10' W., 29.65, WSW., force 4, rain; in 45° 24' N., 46° 17° W., WNW., strong gale, high sea; in 42° N., 42° W., moderate westerly gale, hard squalls; in 48° N., 33° W., WNW., W. and SW., strong gales, gloomy weather, heavy sea; in 48° N., 35° W., SW. and W., heavy gale, high confused sea; in 48° N., 30° W., NW., stormy, high sea, much water on deck; in 45° 09' N., 49° 22' W., heavy SW. gale with tremendous sea. 6th, depression central southwest of Iceland. The following observations were reported from Stykkisholm during the approach and passage of the depression: 5th, 29.13, SW., force 6, snow; 6th, 28.38, NE., force 7, snow; 7th, 28.54, NE., force 8, snow; 8th, 28.88, SE., force 2, snow; 9th, 28.88, N., force 6, fair; 10th, 29.10, E., force 6, clear. The following observations were reported from Godthaab during the approach and passage of the depression: 5th, 29.58, NE., force 4, clear; 6th, 29.50, NNE., force 4, clear; 7th, 29.37, NW., force 3, fair; 8th, 29.26, NNW., force 4, clear; 9th, 29.24, N., force 4, snow. On the 6th, the pressure throughout the British Isles fell to 29.80 and below, showing a change of from 0.10 to 0.60 inch in previous 24 hours. The winds shifted to south and southeast with increased energy and rainy or threatening weather generally prevailed. At North Unst the barometer fell to 28.85, a change of 0.55 inch in past 24 hours, wind SW., force 8; Thorshavn, 28.97, a fall of 0.59 inch, SSE., force 8, fair. 7th, North Unst, 28.88, SW., force 7; Thorshavn, 28.66, W., force 8. 8th, North Unst, 29.20, W., force 4; Thorshavn, 29.19, SSW., force 2. 9th, North Unst, 29.48, S., force 2; Thorshavn, 29.37, S., force 4. Along the Norway coast the barometer ranged on the different dates as follows: 6th, from 29.50 at Tromso to 29.81 at Bergen; 7th, from 29.04 at Brono to 29.32 at Bergen; 8th, from 29.16 at Tromso to 29.29 at Brono; 9th, from 29.30 at Tromso to 29.57 at Bergen. From the 6th to the 8th inclusive, rain or snow prevailed throughout Norway with strong southerly winds. During the 9th the depression passed northeastward over northern Scandinavia and by the following morning was central near the White sea. Archangel, 29.62, SSW., force 4, snow. Passing rapidly southeastward the depression was central morning of the 11th near 60° N., 80° E. Barnaul, 29.45, a fall of 1.05 inches, SW., cloudy; Yeniseisk,

29.58, a fall of 0.79 inch, calm, clear. During the day the depression disappeared in central Siberia under the influence of a high pressure area, 30.60. No. III.—This depression appeared on the 1st south of Greenland as a continuation of area No. XXI, chart No. V, January, 1880. In studying the development of this storm it was deemed advisable to withhold what could only be a partial description with the January chart, and embody the whole in an unbroken narrative accompanying chart No. V, for February. Accordingly the incipient stages of the depression are described as follows: developed slowly in the Plateau regions during the 25th, 26th, and 27th of January, as the result of extended atmospheric changes accompanying the formation and progress of areas Nos. XIX and XXII, January chart. Light rain and snow with variable winds attended its dilatory movement in these regions. The progress of the depression to the eastward for the first three or four days was much delayed owing to the sluggish movement from the British Possessions of a high pressure area in rear of depression No. XIX. By the morning of the 29th the high barometer (30.60) had moved to the Lake Region, while the depression assumed a more decided form and became central in the Middle Slope; lowest barometer at Denver, 29.60, a fall of 0.34 inch, S., clear. During the day the depression moved rapidly northeastward, with increasing energy towards the Upper Lake Region, and by the morning of the 30th, was central in northern Wisconsin, while the high area above referred to embraced the Middle Atlantic States, New England and the Canadian Maritime Provinces. Lowest barometer at Escanaba, 29.48, a fall of 1.20 inches, SW., light rain; Marquette, 29.51, a fall of 1.13 inches, S., cloudy; Milwaukee, 29.65, a fall of 0.88 inch, SW., light rain. 31st, depression central over the Gulf of St. Lawrence, followed throughout the Lake Region, Ohio Valley, Canada and the Middle Atlantic States by westerly winds, with occasional light rain and snow. Lowest barometer at Dalhousie, N. B., 29.22, a fall of 1.50 inches, W., fair; Bathurst, N. B., 29.20, a fall of 1.46 inches, SW., clear; Chatham, N. B., 29.30, a fall of 1.43 inches, SW., cloudy; Little Glace Bay, N. S., 29.40, a fall of 1.15 inches, S., raining. Although the fall in pressure was remarkable and sudden, yet the precipitation accompanying the depression on this day, though quite general, was very light. The highest wind velocities were reported as follows: Mt. Washington, NW., 72 miles; Boston, W. 45; Father Point, N., 42; Yarmouth, N. S., SW., 36; Cape May and Newport, SW., 32; Montreal and Sandy Hook, W., 28. February 1st, depression central south of Greenland. Godthaab, 28.97, a fall of 0.04 inch, ENE., force 4, cloudy; Stykkisholm, 29.10, a rise of 0.43 inch, SW., force 7, snowing. 2d, Godthaab, 28.94, a fall of 0.03 inch, NNE., force 4, cloudy; Stykkisholm, 28.90, a fall of 0.20 inch, SW., force 4, snowing. 3d, Godthaab, 29.22, a rise of 0.28 inch, SW., force 6, snowing; Stykkisholm, 29.22, a rise of 0.32 inch, SW., force 6, snowing. During the day the area moved northeastward beyond Iceland, being central on the 4th in about 67° N., 10° W. Stykkisholm, 29.24, SW., force 4, snowing; Thorshavn, 29.62, a fall of 0.11 inches, W., force 5, cloudy; North Unst, 29.83, a fall of 0.03 inch, SW., force 6, cloudy. 5th, depression central, with diminished energy, off the northwestern coast of Norway. Tromsø, 29.09, a fall of 0.15 inch, SW., snowing; Haparanda, 29.28, a fall of 0.36 inch, SW., clear; Bronø, 29.25, a fall of 0.38 inch, NNE., rain and snow; Bergen, 29.54, a fall of 0.55 inch, S., 35 miles per hour, raining. During the day the depression passed rapidly southeastward over northern Scandinavia and Finland, and by the morning of the 6th was central south of the White Sea, inclosed by the isobar of 29.40. To the westward the winds shifted to northwesterly, with increased force, but accompanied by only a slight rise in pressure, owing to the rapid advance and extended influence of area No. II. The following low pressures were reported from northwestern Russia: Archangel, 29.56, NNE., 18 miles per hour, snowing; St. Petersburg, 29.35, a fall of 0.37 inch, WNW., 29 miles per hour, cloudy; Dorpat, 29.64, a fall of 0.28 inch, WSW., fair; Mos-

cow, 29.68, a fall of 0.19 inch, S., cloudy. The changes in pressure over this region are not very marked, owing to the recent passage of area No. V. 7th, depression central, with greatly increased energy in western Siberia; lowest barometer at Ekaterinburg, 28.83, a fall of 0.49 inch, WSW., 31 miles per hour, drifting snow; this is one of the lowest pressures reported from Ekaterinburg for several years, and was doubtless due to the rapid succession of areas Nos. III, IV and V over that region. Kasan, 29.42, a fall of 0.08 inch, NNW., 27 miles per hour, clear; Krotkovo, 29.55, a fall of 0.11 inch, N., cloudy. 8th, depression central in the valley of the Obi; Ekaterinburg, 30.16, a rise of 1.33 inches, W., 18 miles per hour, clear; Barnaul, 29.76, a fall of 0.12 inch, SW., 22 miles per hour, cloudy; Yeniseisk, 29.56, a fall of 0.39 inch, S., 11 miles, snowing. 9th, depression central in the valley of the Yenisei; Barnaul, 29.57, a fall of 0.19 inch, W., 13 miles, cloudy; Yeniseisk, 29.73, a rise of 0.17 inch, WSW., 20 miles, snowing. During the day the depression disappeared in a high pressure area over central Siberia. 10th, Barnaul, 30.50, SW., cloudy; Yeniseisk, 30.37, calm, clear. No. VI.—This depression appeared to form over the Northern Slope during the 3rd, and by the following morning was central in Dakota, accompanied by snow and southwest to northwest winds. Displaying but very little energy it moved eastward during the day, and by the morning of the 5th was central north of Lake Superior. Moose Factory, 29.87, N., cloudy. During the day the depression disappeared over northern Canada, accompanied by snow in the Lower Lake Region and New England, winds shifting to west and northwest, with rapidly rising pressure. No. VII.—This depression first appeared in the Saskatchewan valley on the 5th, thence moved rapidly southeastward into the Upper Missouri Valley, and by the following morning was central in the Upper Mississippi Valley, accompanied by light to heavy snow; lowest barometers at North Platte and Omaha, 29.89 and 29.93, respectively. 7th, depression central in the Lower Lake Region and rapidly filling up, attended by light snow and southwest to northwest winds. During the day the depression disappeared to the eastward off the Middle Atlantic coast, followed by a decidedly rapid advance of high pressure from the west and northwest. By morning of the 8th an area of 30.60 embraced the Middle Atlantic coast. No. VIII.—Following the rapid disappearance of area No. VII, this depression appeared in the Saskatchewan valley on the 7th and moved rapidly eastward over northern Montana and Dakota to Lake Superior, where it was central on the morning of the 8th, but with little energy. On this morning the barometer at Fort Garry read 30.50, while the area of low was inclosed by the isobar of 30.00. With slowly decreasing pressure at the centre, the depression passed eastward to the Canadian Maritime Provinces, and on the morning of the 9th was inclosed by the isobar of 29.69; lowest barometer (29.42) at Chatham and Dalhousie, N. B. Passing eastward over Newfoundland during the day the depression was central over the ocean on the 10th in about 50° N., 40° W., with greatly increased energy. In 53° 58' N., 27° 49' W., 29.47, SW., force 5, high westerly sea; in 48° 57' N., 38° 04' W., 28.80, WSW., light winds, very heavy rain; in 49° N., 31° 40' W., N. to SW., heavy gale, very high sea; in 48° N., 32° 22' W., strong westerly gale, high sea and rain; in 50° 28' N., 22° W., heavy gale, high sea. 11th, in 52° 54' N., 29° 50' W., 28.41, W., force 10, very heavy westerly sea; in 49° 53' N., 29° 58' W., 29.11 NW., force 3, heavy sea; in 50° N., 23° W., NE., strong gale, heavy seas continually breaking over vessel, five seamen disabled, wind finally backed to SW. with high cross sea, decks swept; in 50° N., 21° W., WNW., hard gale, high sea. 12th, depression central off the northwestern coast of Iceland. The following observations were reported from Stykkisholm during the approach and passage of this depression. 10th, 29.10, E., force 6; 11th, 28.72, E., force 6; 12th, 28.36, SE., force 8, rain; 13th, 29.46, SW., force 7, snow. The following observations were reported from Godthaab during the approach and passage of this depression: 11th, 29.60, N., force 4; 12th, 29.46, NNW., force 5, snow.

No. IX.—This depression began to enter the Northwest during the 8th and by the following morning was central in Dakota. 9th, Bismarck, 29.88, a fall of 0.52 inch, SW., clear; York Factory, 29.88, a fall of 0.20 inch, S., threatening. Between these two stations the pressures at Pembina and Fort Garry were 30.06 and 30.16 respectively, wind S., cloudy. 10th, depression central north of Lake Superior. Moose Factory, 29.79, a fall of 0.59 inch, SW., cloudy; Marquette, 29.90, a fall of 0.58 inch, W., clear; Escanaba, 29.89, a fall of 0.62 inch, NW., cloudy; York Factory, 30.07, SW., snow; Fort Garry, 29.94, SW., clear; Duluth, 29.94, a fall of 0.53 inch, SW., clear. During the day the depression disappeared over northern Canada in a high pressure area, 30.30. No. X.—This disturbance entered the North Pacific Coast on the 10th and passed eastward over Washington Ter.; Olympia, 29.65, a fall of 0.48 inch, SW., fair; Portland, Or., 29.78, a fall of 0.42 inch, SE., cloudy. Moving rapidly eastward during the day the depression became central in western Colorado on the 11th; lowest barometer at North Platte, 29.07, a fall of 0.76 inch, NW., fair; Cheyenne, 29.44, a fall of 0.46 inch, NW., clear; Dodge City, 29.14, a fall of 0.76 inch, SW., cloudy. On this day the isobar of 29.80 embraced almost the entire portion of the United States included within the meridians of 90° and 120° W.; snow with southwest to northwest winds prevailed in the Plateau Regions and threatening or rainy weather with southerly winds in the Mississippi Valley. During the 11th the course of the depression changed from east to northeast as the area moved over the northern portions of the Upper Mississippi Valley and Upper Lake Region. 12th, depression central north of Lake Superior. Moose Factory, 29.01, a fall of 1.06 inches, NE., snow; Marquette, 29.24, a fall of 0.65 inch, W., cloudy; Alpena, 29.20, a fall of 0.94 inch, SW., cloudy; Parry Sound, Ont., 29.24, a fall of 1.01 inches, S., cloudy; Rockliffe, Ont., 29.27, a fall of 1.06 inches, calm, light hail; Saugeen, Ont., 29.28 a fall of 0.95 inch, S., clear. The winds throughout the Upper Lake Region shifted to west with increasing force and in the Lower Lake Region, from southeast to southwest. The eastward movement of the area on the 12th cannot be clearly indicated owing to lack of reports from the country east of Hudson's Bay. On the 13th the depression was probably central near the entrance to Davis Straits. In the Lake Region the winds had shifted to northerly with falling pressure owing to the advance northeastward over the Ohio Valley of area No. XI. In the Canadian Maritime Provinces the barometer fell decidedly with southerly winds, the isobar of 29.60 replacing that of 30.20 of the previous day. The following observations were reported from Godthaab during the approach and passage of the depression. 12th, 29.46, NNW., force 5, snowing; 13th, 29.20, NNE., force 6, cloudy; 14th, 29.20, NE., force 4, cloudy; 15th, 28.99, NNE., force 2, cloudy; 16th, 29.72, NW., force 4, cloudy; 17th, 29.71, NE., force 2, cloudy; 18th, 29.83, NW., force 3, snowing. The following observations were reported from Stykkisholm during the approach and passage of the depression. 13th, 29.46, SW., force 7, snowing; 14th, 28.82, SE., force 8, cloudy; 15th, 29.56, SE., force 6, cloudy; 16th, 29.57, E., force 2, clear; 17th, 29.54, NE., force 8, cloudy; 18th, 29.51, NE., force 8, snowing; 19th, 29.34, NE., force 8, fair; 20th, 29.50, NE., force 7, fair. From the 13th to 19th the winds over the British Isles remained steady from southwest to southeast and east with maximum wind velocities ranging from 24 to 53 miles. The barometer ranged as follows: 13th, 29.88 at North Unst to 30.37 at Helston; 14th, 29.24 at Monach Light-house to 30.02 at Helston; 15th, 28.87 at Valencia to 29.96 at Silloth Rectory; 16th, 28.43 at Roche's Point and 28.45 at Galway to 29.49 at North Unst; on this day the barometers at 30 stations fell below 29.00; 17th, 28.70 at Monach Light-house and Valencia to 29.40 at Helston; 18th, 28.85 at Galway and Monach Light-house to 29.65 at Helston; 19th, 28.34 at Monach Light-house to 29.59 at Helston; on this day the barometers at 15 stations fell below 29.00. The following reports from the logs of vessels indicate the influence of this severe storm. 15th, in 54° 27' N., 19° 50' W., 28.50, SSE., force 8,

very high sea; in 49° 26' N., 11° 57' W., 28.82, SW., force 6, heavy sea; in 51° 20' N., 30° 20' W., hurricane from NW., with dangerous cross sea, decks swept. 16th, in 53° 17' N., 25° 11' W., 28.30, ENE., force 6, heavy sea; St. George's Channel, England, 28.53, SE., force 8, stormy, heavy rain; in 49° 14' N., 16° 02' W., 28.77, NW., force 5, heavy sea, hailing; in 49° 40' N., 13° 31' W., SW., SE., and NW., very stormy; in about 52° N., 30° W., terrific hurricane from southeast to southwest with dangerous cross sea; in 39° 20' N., 59° W., violent hurricane from SW. to NW.; in 46° N., 36° 29' W., violent SW., gale, heavy sea. 17th, in 42° 10' N., 56° 40' W., NNW., strong gale, violent squalls very heavy sea; in about 48° 50' N., 35° 20' W., continuation of violent hurricanes since the 15th, several men washed overboard and drowned, vessel abandoned in a sinking condition; in 51° 08' N., 32° W., 28.98, NNE., force 6, rough sea; in 44° 19' N., 51° 09' W., 29.55, NW., force 9, very heavy sea, snowing; in 49° 07' N., 19° 31' W., 28.65, WNW., force 6, heavy sea. 18th, in about 49° N., 30° W., wind veered to NNW., blowing a hard gale, with violent squalls of hail, high cross sea, vessel ran to SSW. for 30 hours when gale moderated, barometer gradually rose from 28.80 to 30.14; in 45° N., 42° 26' W., NNW., strong gale, heavy sea; in 45° N., 43° W., violent northerly gale, very high sea; in 41° 34' N., 28° W., W., strong gale, heavy sea continuing all day; in 49° 10' N., 39° 68' W., 29.05, N., force 6, high sea, light rain; in 49° 02' N., 22° 40' W., 28.68, W., force 6, heavy sea, two hours of rain; in 48° 50' N., 26° 52' W., 29.16, W., force 5, cloudy. The peculiar movement of the depression from the 14th to the 19th was probably due to the very high pressures over central and northern Europe, which did not give way until the morning of the latter date. 13th, pressures ranged from 30.20 to 30.79, highest in southeastern Russia; 14th, from 30.15 to 30.62, highest in southeastern Russia; 15th, from 30.10 to 30.72, highest in northern Russia; 16th, from 30.00 to 30.87, highest in northwestern Russia; 17th, from 30.00 to 30.91, highest in northwestern Russia; 18th, from 30.00 to 30.77, highest in northwestern Russia; 19th, 30.00 to 30.69, highest in southern Russia. On this day (19th) the isobar of 29.80 ran continuously from 20° E., to 70° W., and generally embraced the region between the parallels of 40° and 70° N., the centre of the depression being located over the Hebrides, barometer, at Monach Light-house, 28.34. Continuing the course of the area to the eastward, it was found to be central on the morning of the 20th north of Scotland; lowest barometer at North Unst, 28.75, S., cloudy; Monach Light-house, 28.96, NW., fair; Aberdeen, 28.93, SW., cloudy; Bolton, 29.10, SW., threatening; Thorshavn, 28.84, NE., cloudy; Bergen, 28.93, S., raining; Brono, 29.10, ESE., cloudy; Christiania, 29.14, NNE., snowing; Tromso, 29.31, SE., clear. Throughout Sweden the barometer ranged from 29.22 at Upsala to 29.61 at Haparanda, winds east to south. 21st, depression central in southern Sweden, with greatly diminished energy. Wisby, 29.32, W., cloudy; Stockholm, 29.35, NNE., cloudy; Upsala, 29.38, NNE., snowing; Dorpat, 29.40, a fall of 0.21 inch, ESE., snowing. 22d, depression central east of the Gulf of Finland. St. Petersburg, 29.70, a rise of 0.21 inch, NNE., fair; Dorpat, 29.77, a rise of 0.37 inch, NNW., fair; Moscow, 29.63, a fall of 0.29 inch, S., cloudy; Archangel, 29.48, a fall of 0.14 inch, SE., cloudy. During the day the depression moved eastward to central Russia, gradually filling up. 23d, Kasan, 29.85, S., snowing; Lugan, 29.78, SW., cloudy; Moscow, 29.79, N., cloudy; Archangel, 29.80, W., clear. During the day the course of the depression changed to the south, and on the following morning the area was central in about 40° N. 40° E. Lugan, 29.85, WSW., fair. Depression rapidly filling up, and by the morning of the 25th the isobar of 30.15 replaced that of 29.80 of the day before. No. XI.—As area No. X passed northeastward to the Upper Lake Region on the 11th this depression developed over western Texas, probably through the influence of the warm southerly winds from the Western Gulf, which at that time, prevailed throughout Texas and northward to Kansas. During

the 12th the depression passed rapidly northeastward over the Western Gulf States, accompanied by southerly gales along the northern Gulf coast, and heavy rains throughout Arkansas, Tennessee and the Ohio Valley. Violent local storms occurred in portions of Kentucky and Tennessee, causing considerable destruction to property. Lowest barometers were reported as follows: Coleman City, Tex., 29.42; Concho, Tex., 29.27; Dodge City, Kan., 29.48; Ft. McKavett, Tex., 29.19; Ft. Sill, Ind. T., 29.46. 13th, depression central in Kentucky; Nashville, 29.52, a fall of 0.32 inch, S., heavy rain, 2.63 inches in past 24 hours; Cairo, 29.52, a fall of 0.31 inch, N., light rain; Knoxville, 29.60, a fall of 0.39 inch, SW., cloudy; Memphis, 29.50, a fall of 0.33 inch, E., cloudy, 3.05 inches rainfall in past 24 hours. On this day the central area was inclosed by the isobar of 29.60, which embraced a narrow barometric trough extending from Arkansas northeastward to southern New York. The isobar of 29.80 embraced almost the entire country east of the 90th meridian, and from the Atlantic coast it ran thence eastward just north of parallel 40° to the British Isles, and again northeastward to parallel 70° N., inclosing within this vast region three separate areas of low pressure, viz: Nos. X, XI and XII. The heavy rains of the 12th and 13th caused dangerous freshets in the Ohio, Cumberland and Tennessee rivers, and considerable property was destroyed by floods. Moving rapidly northeastward over the Ohio Valley and Middle Atlantic States on the 13th, the depression became central on the following morning over the ocean southwest of Nova Scotia. Eastport, Me., 29.46, a fall of 0.19 inch, NE., light rain; Portland, Me., 29.42, a fall of 0.23 inch, NW., light rain; Yarmouth, N. S., 29.42, a fall of 0.31 inch, SE., foggy; Little Glace Bay, N. S., 29.62, NE., snowing; Halifax, N. S., 29.55, a fall of 0.13 inch, NE., light rain; St. John, N. B., 29.62, NE., rain and hail. During the day the depression passed northeastward over the Canadian Maritime Provinces, followed by rapidly rising pressure, with winds shifting to northerly. The effect of the depression as it passed eastward over the ocean is indicated to some extent by the following reports: 14th, in 44° N., 47° W., NW., strong gale, high sea; in 44° N., 46° W., NW. and W., strong gale, heavy westerly sea; in 47° N., 40° W., NNW., moderate gale, high confused sea. During the 15th the depression combined with area No. X then central in about 55° N., 35° W. No. XIII.—This disturbance entered the north Pacific coast on the 14th accompanied by light to heavy rains in Oregon and Washington Territory. Olympia, 29.81, a fall of 0.47 inch, SW., light rain, 2.46 inches in past 24 hours; Portland, Or., 30.02, a fall of 0.39 inch, SW., heavy rain; Umatilla, 29.99, a fall of 0.49 inch, W., cloudy. During the day the depression passed rapidly eastward along the northern boundary of the United States, accompanied by northerly winds and snow in the Saskatchewan valley and southerly winds with cloudy and threatening weather in the northern Rocky Mountain Region. 15th, depression central in northern Minnesota; Breckenridge, 29.52, a fall of 0.47 inch, W., fair; Duluth, 29.77, a fall of 0.09 inch, NW., cloudy; St. Paul, 29.63, a fall of 0.21 inch, SE., fair; Pembina, 29.51, a fall of 0.36 inch, E., cloudy. During the day the depression rapidly filled up over the Upper Lake Region and by the morning of the 16th had disappeared over northern Canada. No XIV.—This depression entered the North Pacific Coast on the 15th, following closely the disappearance to the eastward of area No. XIII. Olympia, 29.62, a fall of 0.19 inch, NW., light snow; Portland, Or., 29.66, a fall of 0.36 inch, calm, fair; Roseburg, Or., 29.81, a fall of 0.51 inch, SW., light rain; Umatilla, 29.69, a fall of 0.30 inch, SE., light rain. During the day the depression passed rapidly eastward over the Plateau Regions and by morning of the 16th was central in the Middle Slope. Cheyenne, 29.72, a fall of 0.10 inch, SW., clear; North Platte, 29.19, a fall of 0.47 inch, S., fair; Denver, 29.55, a fall of 0.33 inch, NW., clear; Dodge City, 29.39, a fall of 0.46 inch, S., fair. Very little precipitation attended the area on this day, either preceding or following its northeasterly movement. For the 24 hours ending morning of the 17th, only fifteen stations throughout the

United States reported even the slightest precipitation, the amounts ranging from trace to 0.34 inch. 17th, depression central with greatly diminished energy in northern Wisconsin, inclosed by the isobar of 29.80, which extended southwestward from Lake Superior to the Rio Grande Valley. Along the western limit of this area the winds were west and northwest with clear or partly cloudy weather, and along the eastern limit, southerly with generally cloudy weather. 18th, depression central over the Province of Ontario, inclosed by the isobar of 29.80. Parry Sound, 29.66, a fall of 0.44 inch, W., light rain; Stratford, 29.77, a fall of 0.37 inch, SW., heavy rain; Granton, 29.76, a fall of 0.37 inch, calm, raining. Port Stanley, 29.82, a fall of 0.37 inch, W., light rain. 19th, depression central over the Gulf of St. Lawrence, followed over the Lower Lakes and in the Middle Atlantic States by rapidly rising pressure and northwesterly winds with light to heavy snow in the former. Dalhousie, N. B., 29.40, a fall of 0.77 inch, W., clear; Charlottetown, P. E. Island, 29.44, a fall of 0.81 inch, SW., cloudy; Bathurst, N. B., 29.39, a fall of 0.72 inch, NW., fair. 20th, depression central off the Banks of Newfoundland. St. Johns, N. F., 29.57, a fall of 0.52 inch, W., fair; in 44° 11' N., 62° 24' W., 29.79, WNW., force 6, cloudy; in 45° 30' N., 52° 30' W., 29.70, W., force 6, snowing. 21st, depression central in about 55° N., 35° W., inclosed by the isobar of 29.80. It is rather difficult to locate the position of the central area on this date, owing to the lack of sufficient reports and the peculiar disposition of the surrounding depressions; area No. X over southern Scandinavia and the North Sea and area No. XVII central over Baffin's Bay. During the 21st area No. XIV probably combined with No. XVII, the latter then central west of Iceland. No. XV.—This disturbance entered the North Pacific Coast Region on the 18th, the isobar of 29.60 replacing that of 30.20 of the previous day. Light rain, with southerly winds accompanied the depression, extending as far south as central California. As the depression passed to the eastward during the day, light snow with westerly winds, followed its departure in the Middle and Northern Plateau regions. 19th, depression central in Montana; Virginia City, 29.51, a fall of 0.14 inch, calm, cloudy. 20th, central in northern Dakota; Ft. Buford, 29.79, a fall of 0.40 inch, NW., clear; Pembina, 29.70, a fall of 1.07 inches, S., cloudy; Breckenridge, 29.86, a fall of 1.00 inch, S., clear; Ft. Garry, 29.71, a fall of 1.16 inches, SW., clear. The central area was inclosed by the isobar of 29.80, which extended southwestward from Manitoba to New Mexico. The progress of the area on the 19th and 20th was necessarily very slow, owing to the extremely high pressures which prevailed in the Northwest and Upper Mississippi Valley, ranging from 30.60 to 30.86. 21st, depression central over the Province of Ontario, the isobar of 29.60 replacing that of 30.60 of the previous day; Parry Sound, 29.49, a fall of 1.18 inches, SW., light snow; Saugeen, 29.54, a fall of 1.08 inches, W., snowing; Rockliffe, 29.53, a fall of 1.07 inches, NW., cloudy; Montreal, 29.67, a fall of 0.85 inch, S., cloudy; Buffalo, 29.58, a fall of 1.08 inches, SW., heavy snow. Light to heavy snow was reported from 12 Canadian and 8 Signal Service stations within the central depression. Since the 19th the storm has rapidly increased in energy, and now extends its influence to the Atlantic coast, having entirely displaced the high area which first obstructed its translation to the eastward. During the 21st the depression changed its course more to the north, and moved northeastward over the Province of Quebec and the Labrador Peninsula. Leaving the Labrador coast on the 22d, the depression crossed Davis' Straits and was probably central off the western coast of southern Greenland by morning of the 23d; Godthaab, 28.86, a fall of 0.51 inch, S., cloudy. During the day the depression passed rapidly over southern Greenland, and by the following morning was central north of Iceland; Godthaab, 29.77, a rise of 0.91 inch, NW., snowing; Stykkisholm, 29.59, a fall of 0.30 inch, SW., snowing. 25th, depression central in about 67° N., 00° W., Godthaab, 29.89, S., force 6, snowing; Stykkisholm, 29.33, a fall of 0.26 inch, W., cloudy; Thorshavn, 29.32, a fall of 0.50 inch, W.,



cloudy; North Unst, 29.54, a fall of 0.47 inch, WNW., cloudy; Bergen, 29.67, a fall of 0.46 inch, SW., 26 miles per hour, raining; Brono, 29.24, a fall of 0.56 inch, SE., 18 miles, raining; Tromso, 28.99, a fall of 0.60 inch, SSE., cloudy. On this day the isobar of 29.80 embraced the entire region north of 60° N., between the meridians of 60° E. and 40° W. The area of precipitation embraced the British Isles, Scandinavia and portions of northwestern Russia, with southwesterly winds increasing to gales along the various coasts. 26th, depression central in northern Sweden, inclosed by the isobar of 28.60. On this day the isobar of 29.20 embraced the whole of Scandinavia and northwestern Russia. Hernosand, 28.59, a fall of 0.88 inch, S., cloudy; Umea, 28.64, a fall of 0.69 inch, SW., cloudy; Christiania, 28.65, a fall of 1.03 inches, SW., cloudy; Tromso, 28.74, a fall of 0.25 inch, NNW., cloudy; Haparanda, 28.71, a fall of 0.42 inch, S., snowing. 27th, depression central over Finland and slowly filling up; central area inclosed within the isobar of 28.80. Archangel, 28.96, a fall of 0.04 inch, SE., cloudy; Dorpat, 28.58, a fall of 0.72 inch, SSW., snowing; St. Petersburg, 28.73, a fall of 0.49 inch, SSE., light snow; Haparanda, 28.63, a fall of 0.08 inch, N., cloudy. Along the western coast of the Baltic and the Gulf of Bothnia, the winds shifted to northwesterly, with increased force and slowly rising pressure; throughout Russia the winds were from southeast to southwest. 28th, depression central in northeastern Russia, and rapidly filling up. Kasan, 29.53, a fall of 0.34 inch, S., snowing; Ekaterinburg, 29.64, a fall of 0.50 inch, SW., snowing. During the day the depression disappeared in a high pressure area over western Siberia. No. XVI.—Closely following area No. XV this depression entered the Northwest from the Saskatchewan valley on the 21st; Fort Buford, 29.63, a fall of 0.16 inch, SW., clear; Bismarck, 29.79, a fall of 0.09 inch, SW., clear. 22d, depression central in northern Michigan, but with slight energy; lowest barometer at Escanaba, 29.70, a fall of 0.10 inch, wind NW., clear. No precipitation has attended the area since its incipency. 23d, depression central in the western portion of the Middle Atlantic States, followed in the Lower Lakes and Canada by northwesterly winds, with snow. Albany, 29.56, a fall of 0.40 inch, S., light snow; Burlington, 29.48, a fall of 0.42 inch, SW., cloudy; New York, 29.60, a fall of 0.40 inch, W., light rain. During the day the depression passed southeastward off the New England coast, followed over the Middle Atlantic States and in southern New England by northwesterly winds, clear weather and rapidly rising pressure. In northern New England and the Canadian Maritime Provinces, northeasterly winds with snow prevailed. 24th, depression central south of Nova Scotia; Halifax, 29.77, a fall of 0.08 inch, wind shifted from SSE. to NE., cloudy; in 40° 34' N., 69° W., NW., hard gale, very high sea. During the day the depression moved slowly to the northeast, its more rapid progress being hindered by a large area of high pressure northwest of the Azores, within which the barometer ranged from 30.20 to 30.73. 25th, in 43° 10' N., 56° 30' W., 29.83, E., force 6, foggy; in 41° 30' N., 66° 20' W., 29.99, N., force 6, fair. During the 25th the high pressure area, northwest of the Azores remained about stationary, forcing the depression to change its course to almost due north, passing thence over Newfoundland and becoming central on the 26th south of Greenland; Godthaab, 29.87, a fall of 0.02 inch, wind shifted from S., force 6, snowing, to N., force 2, cloudy. 27th, depression central with increased energy south of Iceland; Godthaab, 29.86, NE., force 2, fair; Stykkisholm, 28.88, a fall of 1.07 inches, NW., force 6, cloudy; Thorshavn, 28.98, a fall of 0.56 inch, SW., force 7, cloudy; North Unst, 29.36, a fall of 0.05 inch, W., force, 6, cloudy; the low reading of the barometer at this station was probably as much due to the influence of area No. XV as to the present disturbance. 28th, depression central off the western coast of Norway; lowest barometer at Brono, 29.37, a fall of 0.64 inch, ENE., 36 miles per hour, cloudy. Throughout Scandinavia the pressure at all stations

was below 29.00, and snow with southwest to northwest winds prevailed. In rear of the depression the winds along the coast and over the ocean shifted to northwesterly with great force, reaching a velocity of over 70 miles per hour at Thorshavn. In Denmark, northern Germany, and along the southern shores of the Baltic southwesterly winds prevailed with velocities ranging from 25 to 75 miles per hour accompanied by rain and snow. The pressure over this region had hardly recovered from the passage of area No. XV and therefore the changes were rather inconsiderable except at a few stations. 29th, depression central in Finland where but two days previous area No. XV occupied a similar position. The isobar of 29.60 embraced the whole of Europe north of 50° N., and extended westward to 40° W. The central area was inclosed by the isobar of 28.60 which embraced all territory north of 60° N., and between the meridians of 10° and 40° E. Umea, 28.51, a fall of 0.20 inch, NNW., force 6, cloudy; Haparanda, 28.53, a fall of 0.11 inch, N., cloudy; Brono, 28.53, a rise of 0.16 inch, E., fair; Hernosand, 28.56, a fall of 0.04 inch, NW., fair; Tromso, 28.52, a fall of 0.19 inch, SW., clear; Archangel, 28.69, a fall of 0.15 inch, ESE., cloudy; St. Petersburg, 28.61, a fall of 0.45 inch, W., cloudy; Dorpat, 28.85, a fall of 0.27 inch, WSW., light snow; Moscow, 29.10, a fall of 0.25 inch, S, cloudy; Wilna, 29.23, a fall of 0.20 inch, SSW., threatening. Along the southern and western shores of the Baltic, in northern Germany, northern France, and in the British Isles, southwesterly winds with velocities ranging from 20 to 70 miles per hour prevailed, accompanied by rainy or threatening weather with occasionally heavy snow in northern Germany. A continuation of the course of this area will appear on chart No. V, for March, 1880. No. XVIII.—This depression appeared suddenly over Davis' Straits, north of parallel 60° N. on the 21st, and probably crossed over from the region north of Hudson's Bay. Godthaab, 28.81, a fall of 0.18 inch, S., force 4, cloudy. 22d, depression central northwest of Iceland. Godthaab, 29.37, a rise of 0.56 inch, S., force 6, snowing; Stykkisholm, 29.61, a fall of 0.23 inch, S., force 2, raining. 23d, depression central northeast of Iceland. Stykkisholm, 29.89, a rise of 0.28 inch, SW., cloudy; Thorshavn, 29.90, a fall of 0.25 inch, calm, cloudy; Tromso, 29.38, a fall of 0.34 inch, SW., 36 miles per hour, cloudy; Brono, 29.89, a fall of 0.07 inch, SW., 18 miles, cloudy; Haparanda, 29.89, a rise of 0.15 inch, SW., clear. 24th, depression central east of the White sea and rapidly filling up; lowest barometer at Archangel, 29.59, a fall of 0.21 inch, WSW., 18 miles per hour, fair. During the day the depression disappeared over northwestern Siberia. No. XVIII.—Like most of its predecessors this depression moved rapidly southeastward from the Saskatchewan valley, following closely the disappearance of the previous low area. 23d, central north of Montana, inclosed by the isobar of 29.80. During the day the depression moved eastward into Manitoba, and by the morning of the 24th, was central in northern Minnesota, inclosed by the isobar of 29.40; Fort Gary, 29.48, a fall of 0.40 inch, N., cloudy; Pembina, 29.24, a fall of 0.46 inch, calm, fair; Breckenridge, 29.30, a fall of 0.58 inch, SE., cloudy; St. Paul, 29.43, a fall of 0.58 inch, SE., cloudy; Duluth, 29.48, a fall of 0.55 inch, calm, fair. 25th, depression central in the southern portion of the Upper Lake Region; lowest barometer at Escanaba, 29.30, a fall of 0.36 inch, NW., foggy; Milwaukee, 29.33, a fall of 0.43 inch, SW., cloudy; Grand Haven, 29.38, a fall of 0.49 inch, SE., light rain. Southerly winds with rain prevailed throughout the Ohio Valley, Lower Lakes and in the Province of Ontario. During the day the depression passed eastward with diminishing pressure down the valley of the St. Lawrence, and on the following day combined with area No. XVI off the coast of Labrador. No. XIX.—While the previous area was central near the Upper Lake Region, on the 24th, this depression descended from the Saskatchewan valley, and on the following morning was central in the Northern Rocky Mountain Slope; lowest barometer at North Platte, 29.34, a rise of 0.07 inch, NW., clear; Denver, 29.66, no change, W., clear; Cheyenne, 29.55, a fall of 0.10 inch, W., clear. The pressure in this

region had not recovered from the influence of the recent passage of area No. XVIII, consequently the small changes noted. During the day the depression moved very slowly eastward, with slightly increasing energy, and by the following morning was central in the Upper Mississippi Valley. Owing to the rapid advance of a high pressure area from the region north of Lake Superior, the depression on the two succeeding days was prevented from moving in the usual course to the eastward, and consequently a curved condition of the track is indicated upon the chart. In more concise terms, the depression remained about stationary during most of the 26th and 27th. On the 28th depression central south of Lake Michigan, inclosed by the isobar of 29.80. Chicago, 29.70, a fall of 0.30 inch, N., cloudy; Milwaukee, 29.91, a fall of 0.06 inch, NE., light rain; northeast to northwest winds with rain and snow prevailed throughout the Upper Lake Region and Upper Mississippi Valley, and southerly winds with cloudy weather in the Ohio Valley and Lower Lake Region. 29th, depression central in the Province of Quebec. Cornwall, 29.32, a fall of 0.64 inch, W., clear; Montreal, 29.33, a fall of 0.55 inch, SE., cloudy; Rockliffe, 29.26, a fall of 0.75 inch, E., threatening; Quebec, 29.40, a fall of 0.81 inch, E., sleeting. The area of precipitation extended eastward to Nova Scotia with southeasterly winds. During the day the depression passed eastward over the Canadian Maritime Provinces and on the following morning was probably central off the Nova Scotia coast. The continuation of this area will appear upon chart No. V for March, 1880. No. XX.—This depression appeared on the 28th over the ocean, west of British Columbia, and by the morning of the 29th, had entered that territory, the isobar of 29.80 replacing that of 30.40 of the previous day. Rain and snow with southerly winds prevailed in Oregon and Washington Territory, and with easterly winds in the Northern Plateau Region; Olympia, 29.74, a fall of 0.50 inch, S., light snow; Portland, Or., 29.98, a fall of 0.40 inch, SE., cloudy. The continuation of this area will appear upon chart No. V for March, 1880. Of those areas charted as coming directly from the ocean, the following descriptions are given: No. IV.—This depression appeared on the 1st over northern Scandinavia as a continuation of area No. XXII, of chart No. V. for January, 1880. 1st, Tromsø, 28.84, a fall of 0.17 inch, SW., 29 miles per hour, rain and snow; Haparanda, 29.30, a fall of 0.25 inch, SW., force 6, cloudy; Archangel, 29.17, a fall of 0.31 inch, WSW., 22 miles per hour, cloudy. During the day the depression passed rapidly southeastward over the White Sea, and on the 2d was central in western Siberia; Ekaterinburg, 29.16, a fall of 0.38 inch, WSW., 27 miles per hour, cloudy; Kasan, 29.58, a fall of 0.22 inch, WSW., cloudy. 3d, depression central in the valley of the Obi; Ekaterinburg, 29.52, a fall of 0.36 inch, NW., cloudy; Barnaul, 29.58, a fall of 0.25 inch, SW., 45 miles per hour, cloudy; Yeniseisk, 29.26, a fall of 0.67 inch, E., 13 miles, snowing. During the 4th the depression disappeared in a high pressure area, 30.40 over central Siberia. No. V.—While area No. III was central west of Iceland on the 3d, this depression suddenly appeared off the northwestern coast of Norway; Tromsø, 28.68, a fall of 0.70 inch, SW., raining; Bronø, 29.26, a fall of 0.41 inch, SW., 45 miles per hour, raining; Haparanda, 29.27, a fall of 0.34 inch, SW., force 4, raining. 4th, depression central southeast of the White Sea; Archangel, 29.21, a fall of 0.28 inch, WNW., 18 miles per hour, cloudy; Kasan, 29.14, a fall of 0.59 inch, W., 13 miles, light snow; Ekaterinburg, 29.30, a fall of 0.22 inch, S., cloudy. 5th, depression central east of the Ural Mountains; Ekaterinburg, 29.28, NW., cloudy; Barnaul, 29.93, a rise of 0.02 inch, SW., fair; Yeniseisk, 29.99, a rise of 0.24 inch, wind shifted from SW. to E., clear. 6th, depression probably central between the Obi and Yenisei rivers. As area No. III appeared central in northern Russia on this date and in about the same latitude, an elongated area of barometric minima (29.40) formed in connection with the two depressions and ran eastward, north of 50° N., between the meridians of 30° and 90° E., with the lowest pressure at Ekaterinburg, 29.32, a rise of 0.04 inch, WSW., 13

miles per hour, cloudy; Barnaul, 29.48, a fall of 0.45 inch, SW., 45 miles per hour, cloudy; Yeniseisk, 29.57, a fall of 0.42 inch, S., cloudy. By morning of the 7th the depression had passed east of the Yenisei and during the day disappeared over central Siberia under the influence of a high pressure area, 30.60. No. XII.—After the passage of area No. VIII northeastward north of parallel 50° N. on the 10th, the influence of its energy still remained, and was effective in developing in the vicinity of 40° N., 35° W., another storm of great severity. The following reports from logs of vessels indicate the violent effects of an attempted restoration of atmospheric equilibrium in rear of advancing area No. VIII and which were instrumental in forming area No. XII: 10th, in 42° N., 55° W., WSW. NW. and NNW., violent gales with squalls of rain, very heavy sea; in 42° N., 57° W., W. to NW., hard gale with high confused sea; in 42° 31' N., 54° 31' W., NW., heavy storm with squalls of rain; in 48° 15' N., 49° 10' W., NNW. gale with thick snow, encountered large fields of drifting ice and icebergs between 46° 54' N. and 48° 15' W.; in 41° 30' N., 41° 30' W., heavy westerly gales, high sea. 11th, in 45° N., 46° W., NW. to NNW., violent to moderate gales, rain and snow squalls, high confused sea; in about 45° N., 35° W., terrific westerly gale with high cross sea which at times burst into the saloon, one man washed overboard, steamer made only 80 miles in over 24 hours; in 48° 24' N., 33° 13' W., NW., terrific gale, very high sea; in 47° 13' N., 34° W., SW. and WNW. hurricane, changing to gale from SW. to NW. with tremendous high sea. On the 12th the depression was probably central north of the Azores, the winds at Angra and Ponta Delgado shifted from W. to S., with falling barometer. In 47° N., 38° W., SE. to NW., fresh gale, high head sea; in 46° 33' N., 39° W., SW. to NW., violent gale, with "frightful" sea; in 49° 34' N., 28° 44' W., NW., strong gale, hard squalls, high sea; in 49° 19' N., 21° 50' W., W. to N., hard gale, very high sea; in 44° N., 23° W., hurricane from SSE., vessel thrown on beams end; in 42° 35' N., 35° 55' W., "terrible" gale from SW. to W., lasting 18 hours; in 43° 02' N., 34° 22' W., strong gale veering from SW. to NW., with high seas, 7 p. m. terrific gale from W., very high sea, smashing boats and clearing decks, four seamen lost and vessel thrown on beams end. 13th, depression central in about 50° N., 20° W. In 50° 15' N., 17° 38' W., 28.86, SSW., moderate gale, heavy rain; in 51° 26' N., 34° 50' W., 29.43, NNW., force 9, heavy northerly sea; in 46° 10' N., 43° W., ESE. to NW., heavy gale, high head sea; in 44° 39' N., 43° 48' W., E. to N. with hurricane force, ship on beams end, squalls of rain and snow with a "frightful" sea; in 48° 40' N., 34° 38' W., SE. and variable, strong gale, high confused sea; in 50° 06' N., 13° W., southwest hurricane with tremendous sea, 3 a. m., heavy sea swept decks, noon, wind shifted to WNW., and blew with great violence until midnight when it changed to WSW. with heavy squalls of rain; in 49° N., 25° W., barometer 28.10, violent gale from SW., wind suddenly changed to WNW. in a most violent squall and blew a perfect hurricane, 3 p. m., tremendous westerly sea, 5 p. m., heavy cross sea sweeping decks; in 45° N., 23° W., terrific gale from SW.; in 43° N., 28° W., hurricane from NW., lasting 48 hours; in 42° N., 30° W., "hurricane from SE. all around the compass by W., lasting 24 hours." 14th, depression moved slowly northward and during the day combined with area No. X, then central south of Iceland. In 47° 57' N., 28° W., NW., violent gale, terrific squalls, heavy sea; in 51° N., 13° 33' W., S., and W., strong gale, high sea; in 50° N., 22° 40' W., SE., SW., and NW., strong gale, very high confused sea. The continuation of this severe storm is fully considered under the head of area No. X with which, after the 14th, it became identified and together proved the most violent and extensive atmospheric disturbance of the month.

#### TEMPERATURE OF THE AIR.

The distribution of mean atmospheric temperature over the United States and Canada for the month of January, 1882, is exhibited by lines of equal thermometric mean values upon